



## THE IMPACT OF TRANSFORMATIONAL LEADERSHIP STYLE AND EMPLOYEE CREATIVITY ON ORGANIZATIONAL INNOVATION IN UNIVERSITIES DURING THE COVID-19 PANDEMIC

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### ABSTRACT

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Organizational innovation is one of the important issues for organizations in every country to adapt to changing operating environments, scientific and technological progress, and crisis issues. This study aims to evaluate the impact of transformational leadership style and employee creativity on organizational innovation in universities in Vietnam. We employed Bayesian exploratory factor analysis and Bayesian regression analysis with primary data of leader–employee pairs to explore the abovementioned effects. The findings show that the components of transformational leadership style, including idealized influence (II), inspirational motivation (IM), intellectual stimulation (IS), and individual consideration (IC), have positive impacts on organizational innovation (OI) and employee creativity (EC). The findings also imply that employee creativity (EC) is a mediating factor in the impact of transformational leadership style (TLS) on organizational innovation (OI). Finally, increasing intrinsic motivation (INM) can increase the positive impact of transformational leadership style (TLS) on employee creativity (EC). Based on the results, we propose policy implications to promote organizational innovation in Vietnamese universities in the context of the COVID-19 pandemic.

**Contribution/Originality:** This study is one of very few studies which have applied Bayesian exploratory factor analysis and Bayesian regression to primary data. Our findings clarify the impact mechanism of transformational leadership style on organizational innovation in Vietnamese universities.

## 1. INTRODUCTION

From late 2019 to the present, Vietnam, like the majority of the world's countries, has been facing the COVID-19 pandemic, which has had a huge impact on the economy, affecting everything from manufacturing and commerce to research and development, and daily life in general. To survive, companies must develop new strategies and innovative solutions for adapting to the new normal generated by the pandemic. More than ever, investing in innovation has become one of the world's, and Vietnam's, most sustainable directions. Creativity and innovation seem to have become the official slogans of all organizations. However, companies must recognize the factors that shape and encourage creativity and innovation in order to have real creativity and innovation.

Many studies have emphasized the importance of employee creativity for organizational innovation (Ouakouak & Ouedraogo, 2017) because promoting individual creativity is vital for businesses to remain competitive and survive in the market. Many organizations in different fields constantly look for different ways to inspire their

employees to work creatively and develop innovative ideas (Gu, Tang, & Jiang, 2015). Therefore, many researchers are interested in understanding the creative motivation of employees to identify the factors that develop or inhibit innovation within organizations (Shalley & Zhou, 2008).

Previous studies have shown that leadership is one of the most important factors affecting employees' creative behavior and organizational innovation (Oldham & Cummings, 1996; Prasad & Junni, 2016). In particular, researchers are more interested in transformational leadership styles than other leadership styles (Khalili, 2016). Transformational leaders increase employee confidence and value, and as a result, employee performance has increased beyond their expectations (Gupta, Singh, Kumar, & Bhattacharya, 2012). Especially during the COVID-19 pandemic, employees have had to suffer an imbalance between work and life. How and where employees work has changed a lot due to the pandemic, for which they have never been prepared (Charoensukmongkol & Puyod, 2021). In particular, the shift to teleworking from home has left employees with insufficient information, guidance, and expected outcomes about the work they have to perform (Prasad, Vaidya, & Mangipudi, 2020). Therefore, the attention and inspiration of leaders will help to reduce work pressure for employees. Also, leaders can create intellectual stimulation for employees to encourage creative problem-solving. This will help them adapt to a new way of working, and will also promote organizational innovation. As such, the COVID-19 pandemic has presented transformational leaders with a rare opportunity to play their roles effectively.

Although transformational leadership style and employee creativity have been a topic of interest for many researchers, previous studies have shown mixed results on the impact of transformational leadership on employee creativity, including negative (Basu & Green, 1997), significantly positive (Gong, Huang, & Farh, 2009; Shin & Zhou, 2003), and no relationship (Wang & Rode, 2010). Furthermore, no studies have looked at the direct influence of each component of transformational leadership on employee creativity, and few studies have looked at the direct relationship between organizational innovation and transformational leadership styles.

Previous studies have also demonstrated that intrinsic motivation plays an important role in increasing employee creativity (Amabile, 1983; Shalley & Gilson, 2004; Zhou & Oldham, 2001). However, few studies have examined the moderating effects of intrinsic motivation on the relationship between transformational leadership and employee creativity. For example, studies by Shin & Zhou (2003) and Tan & Chong (2010) found a moderating effect of intrinsic motivation on the relationship between transformational leadership and employee creativity, but Gumusluoglu & İlsev (2009) did not find a significant positive mediating effect. Furthermore, Jyoti & Dev (2015) emphasized examining the moderator variables that form a close relationship on the impact of transformational leadership style on employee creativity. Therefore, the role of intrinsic motivation also needs to be studied further.

For the reasons presented above, this study attempts to contribute to the current theory by examining the link between the four dimensions of transformational leadership style, employee creativity, and organizational innovation. It also contributes to related research by examining the moderating role of intrinsic motivation on the relationship between transformational leadership style and employee creativity in Ho Chi Minh City universities. More than ever, creativity and innovation are essential for educational institutions during the COVID-19 pandemic. These organizations need leaders who are capable of handling rapid change and keeping pace with global challenges. On the other hand, previous studies have employed exploratory factor analysis combined with multiple regression analysis to estimate the parameters in the impact assessment model and infer conclusions. This approach will give reliable results for a large sample size. However, in the case of a small sample size, the robustness of the results will be lower. In the context of the COVID-19 pandemic, primary data collection becomes a challenge common to all research. To overcome this problem, we employed exploratory factor analysis and multiple regression analysis based on Bayesian inference. Specifically, Bayesian inference allows combining the collected data with a priori information to infer conclusions about the posterior distribution of the parameters in the model. Therefore, the results will have better stability than other methods. To the best of our knowledge, this study is the first attempt at applying Bayesian inference to this topic to open up new methodological directions. This study is

structured into five sections. Section 1 presents the Introduction, section 2 contains the Literature Review, the research methodology is presented in section 3, and section 4 and section 5 present Empirical Results, and Conclusion and Policy Implications, respectively.

## 2. LITERATURE REVIEW

### 2.1. *The Impact of Transformational Leadership Style (TLS) on Organizational Innovation (OI)*

Currently, there is no consensus on the definition of organizational innovation (OI) among researchers (Armbruster, Bikfalvi, Kinkel, & Lay, 2008; Lam, 2006; OECD, 2005). The most commonly used definition is suggested by OECD (2005). Accordingly, OI is the implementation of new organizational methods. These can be changes in business practices, the workplace, or the organization's external relations. In this study, we define organizational innovation (OI) in universities as the efforts of unit heads to use/implement new ideas, behaviors, products, services, technologies, and governance practices. Regarding the impact of transformational leadership style on organizational innovation, Khalili (2016) argues that transformational leaders motivate and encourage their followers to take risks. After that, transformational leaders can exploit the creative environment and stimulate employees to work creatively. In addition, transformational leaders motivate their employees to find alternative ways to accomplish their tasks, thereby developing innovative and creative ideas. Various empirical studies have demonstrated a positive and significant impact of transformational leadership on organizational innovation (Gumusluoglu & İlsev, 2009; Keller, 1992; Uddin, Fan, & Das, 2016). Leaders provide knowledge by demonstrating learning behavior to encourage employees to generate new ideas (Razavi & Ab Aziz, 2017). Leaders' intellectual stimulation and inspirational motivation play an important role in organizational innovation (Elkins & Keller, 2003; Nardelli, 2017). Therefore, in this study, we hypothesize the following:

*H1: Transformational leadership style has a positive impact on organizational innovation in universities.*

*H1a: Idealized influence has a positive impact on organizational innovation in universities.*

*H1b: Inspirational motivation has a positive impact on organizational innovation in universities.*

*H1c: Intellectual stimulation has a positive impact on organizational innovation in universities.*

*H1d: Individual consideration has a positive impact on organizational innovation in universities.*

### 2.2. *The Impact of Transformational Leadership Style (TLS) on Employee Creativity (EC)*

Transformational leaders share knowledge, foster new ideas, and support employees' creative thinking (Jyoti & Dev, 2015; Prasad & Junni, 2016). Leaders also support employees to overcome their fear of risk and revolutionize everyday ways of working, leading to a high level of creativity. Research by Yunus & Anuar (2012) indicates that transformational leaders encourage employees to take new approaches to accomplishing their tasks. Additionally, by influence, leaders inspire their employees and earn respect and loyalty.

By defining a vision and a path to achievement, transformational leaders inspire and encourage workers to achieve their objectives. Through intellectual stimulation, employees are stimulated to perform work creatively (Avolio, Bass, & Jung, 1999). Through individual consideration, leaders pay attention to each employee to meet their needs (Ng, 2017). In addition, transformational leaders also build strong relationships with their employees, leading to improved job performance (Ng, 2017). Therefore, in this study, we hypothesize the following:

*H2: Transformational leadership style has a positive impact on employee creativity in universities.*

*H2a: Idealized influence has a positive impact on employee creativity in universities.*

*H2b: Inspirational motivation has a positive impact on employee creativity in universities.*

*H2c: Intellectual stimulation has a positive impact on employee creativity in universities.*

*H2d: Individual consideration has a positive impact on employee creativity in universities.*

*2.3. The Mediating Role of Employee Creativity in the Relationship between Transformational Leadership Style and Organizational Innovation*

The above arguments have shown that transformational leadership styles have an impact on employee creativity, which is the equivalent of raw material essential for the growth of the organization (Lukes & Stephan, 2017). According to OECD (2010), employee creativity is the driving force behind organizational innovation. Organizational innovation reflects the process by which innovative ideas are realized. In the process, transformational leaders create an environment that motivates employees to learn, share, and explore innovative ways of working. Organizations that encourage employee creativity to turn ideas into new products and services gain market competitiveness (Kremer, Villamor, & Aguinis, 2019). Considering the above arguments, we propose the following hypothesis:

*H3: Employee creativity acts as a mediator between transformational leadership styles and organizational innovation in universities.*

*2.4. The Moderating Role of Intrinsic Motivation in the Relationship between Transformational Leadership Style and Employee Creativity*

Intrinsic motivation is an employee’s interest in performing certain tasks for their own benefit instead of being influenced by external sources (Gumusluoglu & İlsev, 2009). Previous research has shown that employees are more creative when they have higher intrinsic motivation (Gumusluoglu & İlsev, 2009; Shalley & Gilson, 2004; Zhou & Oldham, 2001). According to social exchange theory, through personal attention, encouragement, and concern for all employees, transformational leaders can influence employees to realize their potential creativity. As a result, employees will experience high levels of intrinsic motivation (Zhou & Oldham, 2001) leading to high levels of creativity (Amabile, Conti, Coon, Lazenby, & Herron, 1996). Furthermore, intrinsic motivation plays a reinforcing role in increasing employee creativity (Zhou & Oldham, 2001). The studies of Shin & Zhou (2003) and Tan & Chong (2010) found a moderating effect of intrinsic motivation on the relationship between transformational leadership style and employee creativity. Therefore, we propose the following hypothesis that explores the moderating role of intrinsic motivation on the relationship between transformational leadership style and employee creativity:

*H4: Intrinsic motivation modifies transformational leadership’s influence on employee creativity, and this relationship increases when intrinsic motivation is high, and vice versa.*

**3. RESEARCH METHODOLOGY**

*3.1. Research Model*

Based on a brief review of related studies and research hypotheses mentioned above, we built a research model as follows:

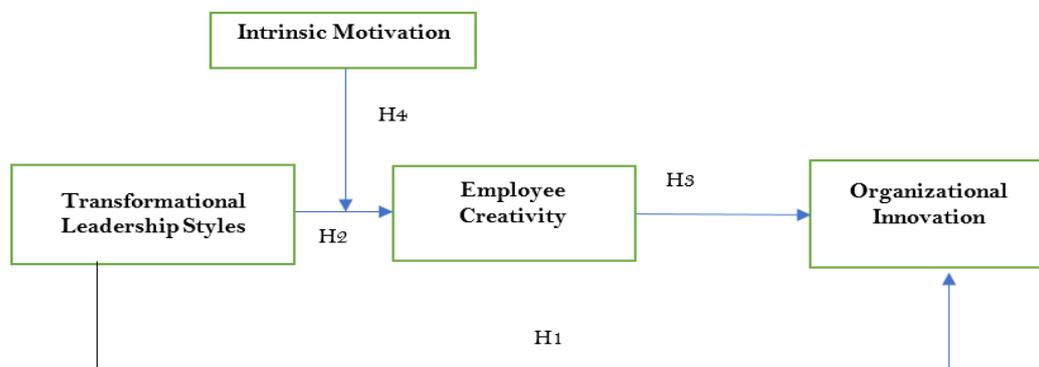


Figure 1. Research model.

Figure 1 shows the research model, including transformational leadership style, employee creativity, intrinsic motivation, and organizational innovation at universities in Ho Chi Minh City. Specifically, the transformational leadership style scale is taken from the study by Avolio et al. (1999) and includes four factors: idealized influence (II) measured through four observed variables; inspirational motivation (IM) measured through five observed variables; intellectual stimulation (IS) measured through four observed variables; and individual consideration (IC) measured through four observed variables. The employee creativity scale (EC) is taken from the study by Zhou & George (2001) and includes six observed variables; the intrinsic motivation scale (INM) is adopted from the study by Tierney, Farmer, & Graen (1999) and includes four observed variables; and the organizational innovation scale (OI) is taken from the study by Ouakouak & Ouedraogo (2017) and includes four observed variables.

### 3.2. Research Sample and Collection Method

The study conducted a survey with pairs of employees and direct leaders at universities in Ho Chi Minh City. Here, a leader and employee pair is understood to be an employee and the employee's direct manager. Each employee-leader pair that responds to the questionnaire will correspond to one observation collected in the data. Specifically, we collected data on transformational leadership style factors and intrinsic motivation through interviews with employees. Data on factors of employee creativity and organizational innovation were collected through interviewing leaders.

According to Hair, Black, Babin, Anderson, & Tatham (2006), the sample size is determined based on the minimum level, and the number of variables included in the model. The minimum sample size is 50 observations. At the same time, the sample size must be five times the number of variables included in the analysis. In this study, the total number of observed variables included in the model is 31, so the minimum sample size should be 155 observations.

In fact, in this study, we conducted a survey of 290 pairs of leaders and employees at universities in Ho Chi Minh City. Due to the impact of the COVID-19 pandemic, to collect the research sample, we followed the non-probability sampling method. Specifically, we sent a survey using a QR code. Through the relationship with the organizational departments of the universities, the questionnaires were also emailed to the pairs of leaders and employees. Between February 2021 and June 2021, we issued 290 surveys and a total of 236 responses were obtained, of which 21 responses contained missing information. After deductions, we used a total of 215 observations.

### 3.3. Research Process

In this study, we use a combination of qualitative and quantitative research methods.

#### 3.3.1. Qualitative Research Method

The qualitative research method is used to develop research hypotheses, research models, and scales in research models. We selected two groups to conduct qualitative research, including (i) experts in the fields of human resources, higher education; (ii) middle managers at Vietnamese universities who have worked in the industry for five years or more. The members participating in the discussion are selected according to the snowball method. First, we will select a few people based on acquaintances who are experts in the field of human resource management. These experts will then invite other members who also have many years in this field to join the discussion. After synthesizing scales from previous studies, we conducted group discussions with seven experts and 16 middle managers at Vietnamese universities. The purpose of the discussion is to evaluate and adjust the scale to suit research conditions in Vietnam.

3.3.2. Quantitative Research Method

3.3.2.1. The Reliability of the Scale

The reliability of the scale is assessed by the Cronbach’s Alpha coefficient given by Cronbach (1951) and the item-total correlation coefficient of the observed variables in the scale. Criteria for choosing a scale is when the reliability of Cronbach’s Alpha is greater than 0.6 (Nunnally & Bernstein, 1994). Observed variables with a corrected item-total correlation of less than 0.3 will be excluded (Nunnally & Bernstein, 1994).

3.3.2.2. Bayesian Analysis

Bayesian analysis is characterized by the posterior distribution of the parameters in the model. Based on the collected data and some prior information, Bayesian analysis generates a posterior distribution of all parameters. Therefore, the posterior distribution has two parts: the probability, which contains information about the model’s parameters based on the collected data, and the prior distribution, which includes information about the model’s parameters before the data is observed. Bayesian analysis is used to combine the maximum likelihood function and the prior distribution to generate the posterior distribution:

$$\text{Posterior Distribution} \propto \text{Maximum Likelihood Function} \times \text{Prior Distribution}$$

The posterior distribution is made up of Markov chain Monte Carlo (MCMC) methods of well-known sampling algorithms, such as Metropolis–Hastings and Gibbs. However, a problem with Bayesian analysis is that the MCMC series must achieve convergence. Additionally, the a priori distributions also need to be determined with reasonable parameters to ensure that the posterior distribution results are reliable.

3.3.2.3. Bayesian Exploratory Factor Analysis (BEFA)

Bayesian exploratory factor analysis begins with a basic factor analysis model as follows:

$$\begin{aligned} X_i &= l' F_i + u_i \\ F_i &: N(0, R) \\ u_i &: N(0, \hat{\sigma}^2) \end{aligned}$$

where,  $X_i = (X_{i1}, \dots, X_{iM})'$  is the vector of  $M$  variables in the scales,  $i$  is the  $i$ th observation that receives values from 1 to  $n$  (sample size),  $u_i = (u_{i1}, \dots, u_{iM})'$  is the vector of  $M$  error components in each model,  $F_i = (F_{i1}, \dots, F_{iK})'$  is a vector of  $K$  factors extracted from the exploratory factor analysis, and  $l$  is the  $(M \times K)$  matrix of the factor loading coefficients.

$F_i$  and  $u_i$  are assumed to follow normal distributions with a mean of 0 and variances of  $R$  and  $\hat{\sigma}^2$ , respectively.

The Bayesian exploratory factor analysis in this study was carried out as suggested by Conti, Frühwirth-Schnatter, Heckman, & Piatek (2014). Specifically, Conti et al. (2014) used a binary matrix  $\Delta$  (matrix consisting of only elements of 0 and 1) to perform the allocation of observed variable  $X_i$  according to the factor  $F_i$ . The binary matrix  $\Delta$  is of the same order  $(M \times K)$  as the matrix  $l$ . For example, the  $m$ th observation variable ( $X_m$ ) will be allocated to the  $k$ th factor ( $F_k$ ), then the  $m$ th row of the  $\Delta$  matrix will have the following values:

$$D_m = (0, \dots, 0, \underset{\text{the } k\text{th factor } (F_k)}{1}, 0, \dots, 0) \otimes e_k$$

When an observed variable is not allocated to any factor, all values in the same row of the matrix  $\Delta$  corresponding to that observable variable will be 0. Conti et al. (2014) assumed that no observed variable can be loaded for more than one factor, so the sum of the values in the  $k$ th column of the matrix  $\Delta$  corresponds to the  $k$ th factor ( $F_k$ ) will not exceed 1.

According to Conti et al. (2014), to perform the BEFA, it is necessary to determine the prior distributions for the parameters, including  $t_k$  ( $t_k = Pr(D_m = e_k | t_k)$ ), which is the probability of the observed variable  $m$ th is

allocated to the kth factor;  $\hat{\sigma}^2$ , which is the variance of the error component;  $l_i$ , which is the factor loading, and  $R$ , which is the variance of the factor. In this study, we used prior distributions as suggested by Conti et al. (2014). The maximum number of factors (K) was determined according to Ledermann (1937) and rounded to 5. The MCMC size was determined to be 25000, with a burn-in period of 2500.

3.3.2.4. Bayesian Regression Analysis

Bayesian regression analysis begins with a basic regression model as follows:

$$Y = bF_i + e_i$$

where Y is the dependent variable,  $b = (b_1, \dots, b_K)$  is the vector of estimated parameters, and  $F_i = (F_1, \dots, F_K)'$  is the vector of factors extracted from the BEFA.

In Bayesian regression analysis, the posterior distribution of the parameters  $b_i$  will be determined as follows:

$$\text{Posterior Distribution}_{b_i} \propto \text{Maximum Likelihood Function} \times \text{Prior Distribution}_{b_i}$$

Table 1. Cronbach's alpha analysis results.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item - Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
II1	9.88	3.253	0.607	0.773	0.811
II2	9.87	3.061	0.647	0.754	
II3	9.83	3.302	0.609	0.773	
II4	9.91	3.072	0.653	0.751	
IM1	12.81	5.591	0.661	0.846	0.867
IM2	12.73	5.415	0.695	0.837	
IM3	12.19	5.414	0.701	0.836	
IM4	12.16	5.265	0.692	0.838	
IM5	12.20	5.133	0.700	0.837	
IS1	9.65	3.406	0.690	0.826	0.858
IS2	10.18	3.557	0.728	0.810	
IS3	9.73	3.565	0.701	0.820	
IS4	9.61	3.603	0.696	0.823	
IC1	10.02	3.252	0.637	0.799	0.832
IC2	9.99	3.318	0.671	0.782	
IC3	10.04	3.349	0.670	0.783	
IC4	10.11	3.395	0.664	0.786	
OI1	9.99	4.089	0.742	0.780	0.847
OI2	9.94	4.287	0.646	0.822	
OI3	9.96	4.148	0.735	0.783	
OI4	9.93	4.439	0.615	0.834	
EC1	15.40	10.812	0.889	0.949	0.959
EC2	15.37	11.093	0.815	0.957	
EC3	15.37	10.992	0.856	0.952	
EC4	15.47	10.718	0.894	0.948	
EC5	14.34	11.161	0.867	0.951	
EC6	14.39	10.791	0.899	0.948	
INM1	7.61	3.893	0.560	0.823	0.814
INM2	8.09	4.860	0.626	0.776	
INM3	8.09	4.720	0.654	0.763	
INM4	8.03	3.826	0.764	0.699	

Note: II = idealized influence; IM = inspirational motivation; IS = intellectual stimulation; IC = individual consideration; OI = organizational innovation; EC = employee creativity; INM = intrinsic motivation.

The maximum likelihood function will compute estimates of  $b_i$  based on the data. Therefore, to determine the posterior distribution of the parameters  $b_i$  we only need to know more information about a prior distribution of the parameters  $b_i$ . In this study, we determined a prior distribution of the parameters  $b_i$  according to the normal distribution as follows:

$$b_i : N(\hat{b}_i, SD_{\hat{b}_i}^2)$$

where  $\hat{b}_i, SD_{\hat{b}_i}^2$  are the point estimate and standard deviation of the parameter  $b_i$ , respectively, obtained from the regression analysis by the ordinary least squares (OLS) method. The MCMC size is defined as 27500, with a burn-in period of 2500 (the number of samples will be removed from the MCMC size).

#### 4. EMPIRICAL RESULTS

##### 4.1. The Results of Evaluating the Reliability of the Scales

First, we evaluated the reliability of the scales, including transformational leadership style, employee creativity, intrinsic motivation, and organizational innovation.

Table 1 shows that Cronbach's Alpha coefficient of all scales is greater than 0.6, and the corrected item-total correlation of all observed variables in the scales is greater than 0.3. Therefore, the scales are reliable.

##### 4.2. Bayesian Exploratory Factor Analysis with the Transformational Leadership Style Factor

Before performing the BEFA, we evaluated the correlation between the observed variables in the transformational leadership style scale.

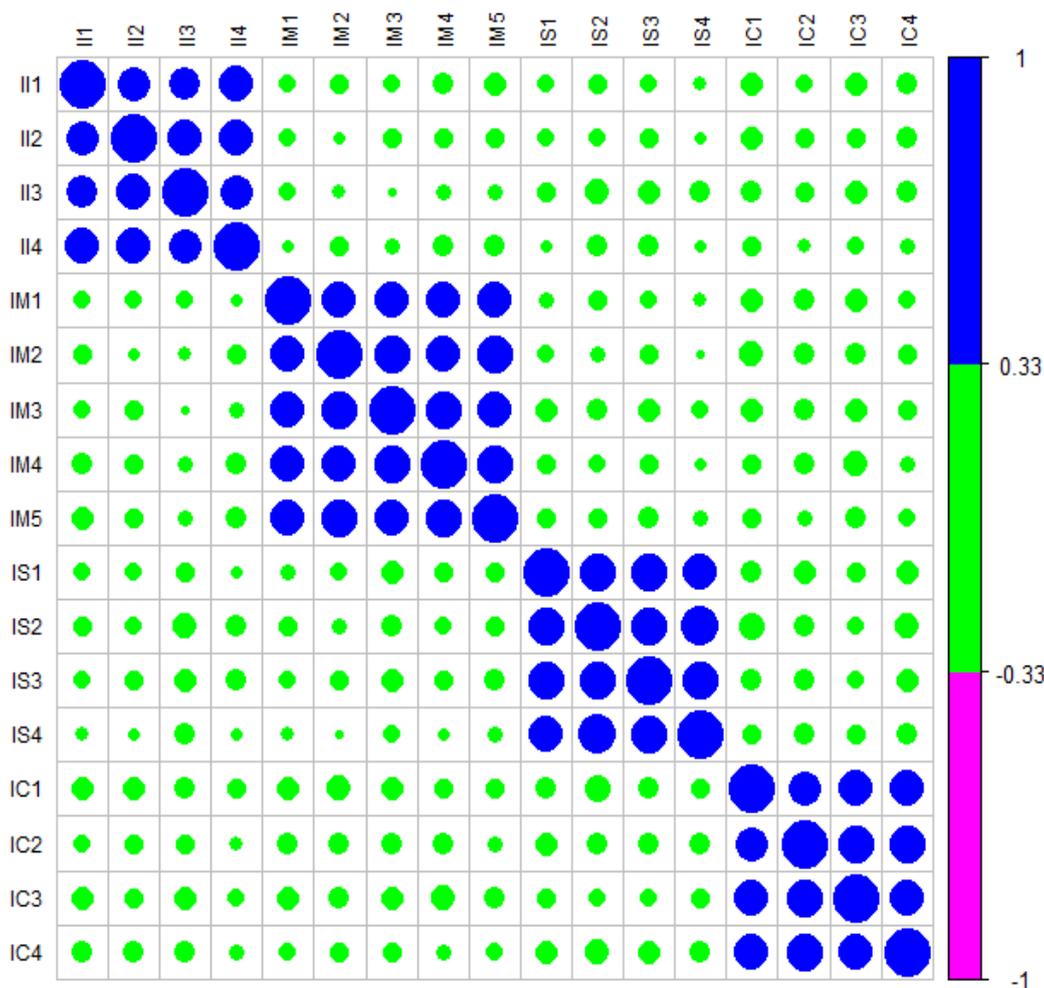


Figure 2. Correlation matrix.

Figure 2 shows that observed variables II1, II2, II3, II4 are highly correlated with each other; IM1, IM2, IM3, IM4, IM5 are highly correlated with each other; IS1, IS2, IS3, IS4 are highly correlated with each other; and IC1,

IC2, IC3, IC4 are also highly correlated with each other. Thus, the observed variables in the transformational leadership style scale represent four aspects of this scale, namely idealized influence (II), inspirational motivation (IM), intellectual stimulation (IS), and individual consideration (IC).

Next, Bayesian exploratory factor analysis was performed with the Metropolis–Hastings sampling algorithm. The results are presented in the figures below.

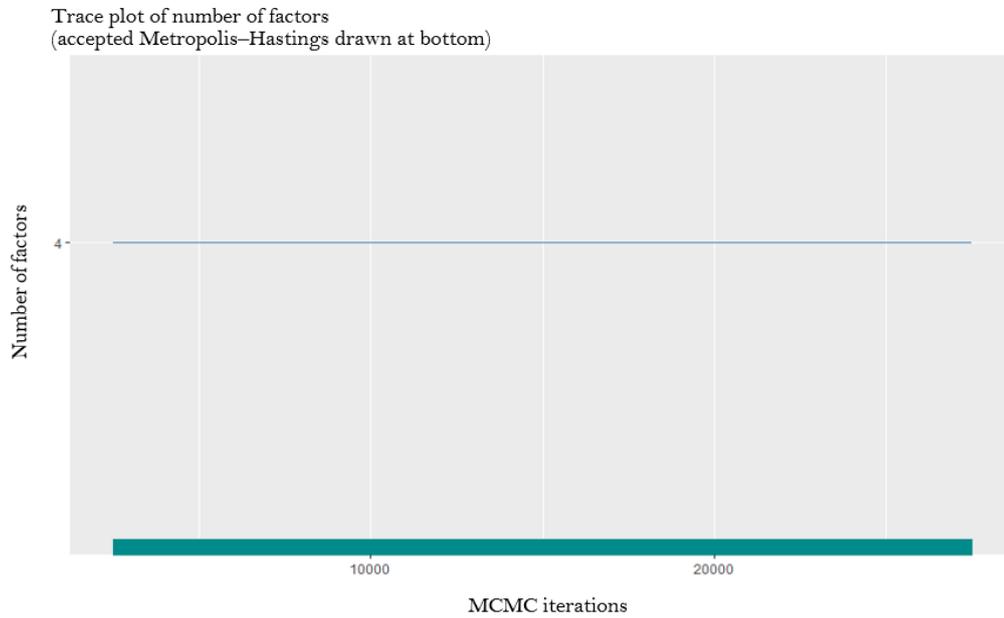


Figure 3. The trace plot of the number of factors.

Figure 3 shows the results of the trace plot. The MCMC size is 27500 with a burn-in period of 2500. Thus, the MCMC size for analysis is 25000. The trace plot shows that there are four factors extracted from the transformational leadership style scale in the 25000 times analysis.

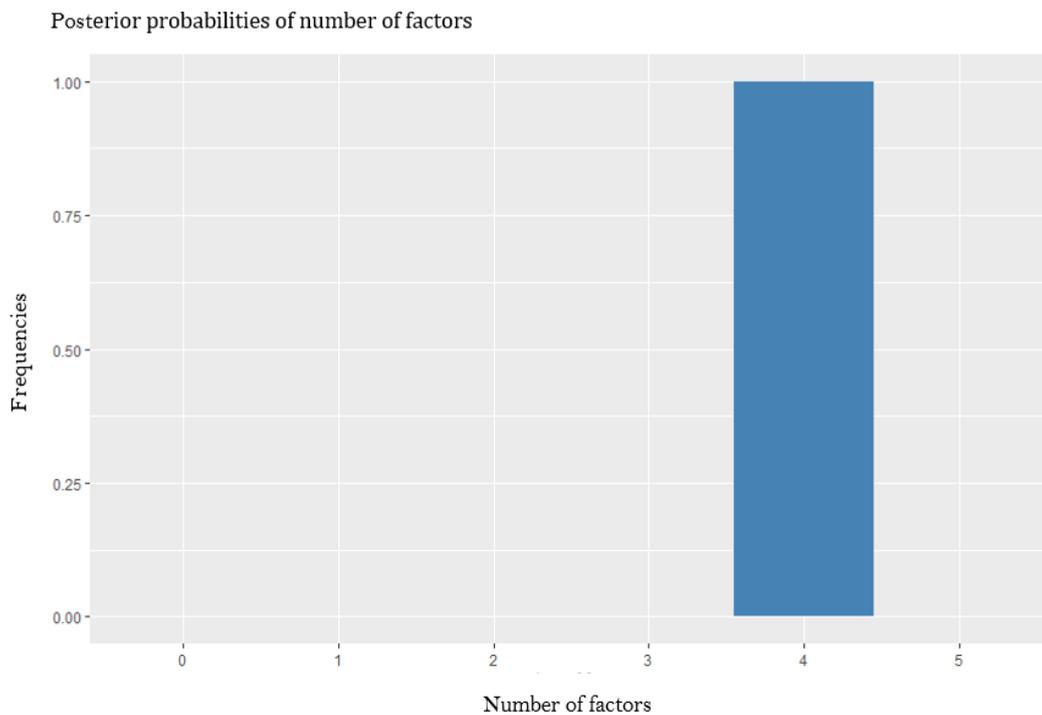


Figure 4. The posterior probabilities of the number of factors.

The results shown in Figure 4 further confirm the number of factors extracted from the Bayesian exploratory factor analysis. Specifically, the posterior distribution shows that the probability of extracting four factors from the transformational leadership style scale is 100%.

The results of the allocation of the observed variables into four factors are presented in Table 2.

Table 2. The results of factor loadings.

	Factor	Prob.	Mean	[95% hpd]	
alpha:II1	1	1	0.701	0.568	0.831
alpha:II2	1	1	0.743	0.615	0.872
alpha:II3	1	1	0.703	0.573	0.837
alpha:II4	1	1	0.744	0.621	0.876
alpha:IM1	2	1	0.722	0.602	0.851
alpha:IM2	2	1	0.761	0.64	0.882
alpha:IM3	2	1	0.771	0.655	0.896
alpha:IM4	2	1	0.761	0.641	0.881
alpha:IM5	2	1	0.765	0.643	0.886
alpha:IS1	3	1	0.763	0.647	0.89
alpha:IS2	3	1	0.815	0.696	0.935
alpha:IS3	3	1	0.776	0.656	0.9
alpha:IS4	3	1	0.767	0.648	0.893
alpha:IC1	4	1	0.727	0.598	0.852
alpha:IC2	4	1	0.757	0.634	0.884
alpha:IC3	4	1	0.755	0.629	0.879
alpha:IC4	4	1	0.748	0.619	0.869

Note: Maximum number of factors (Kmax): 5  
Metropolis–Hastings acceptance rate: 0.999.

The “Factor” column of Table 2 shows the factor to which the observed variable is allocated; the “Prob” column shows the posterior probability to which the observed variable is allocated; the “mean” column shows the posterior mean of the factor loading; and the “[95% hpd]” column shows the 95% credible interval of the factor loading.

The allocation of observed variables to each factor is shown in Table 2. The results show that the posterior mean of the factor loading coefficient of each observed variable has a value greater than 0.5. Figure 5 shows a visualization of the allocation of observed variables to each factor.

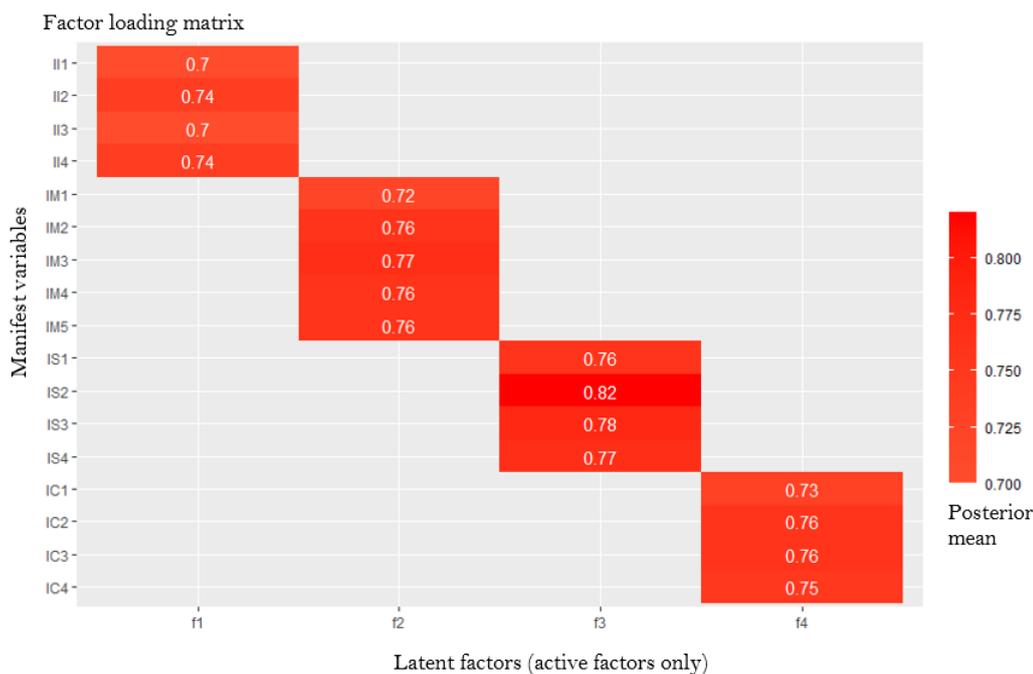


Figure 5. Factor loading matrix.

So, the BEFA extracted four factors, and the observed variables in each factor had a factor loading coefficient greater than 0.5. The specific factors are as follows:

The first factor includes observed variables II1, II2, II3, II4, representing idealized influence. This is calculated as the mean of the components of the observed variables.

The second factor includes observed variables IM1, IM2, IM3, IM4, IM5, representing inspirational motivation. This is calculated as the mean of the components of the observed variables.

The third factor includes observed variables IS1, IS2, IS3, IS4, representing intellectual stimulation. This is calculated as the mean of the components of the observed variables.

The fourth factor includes observed variables IC1, IC2, IC3, IC4, representing individual consideration. This is calculated as the mean of the components of the observed variables.

#### 4.3. Exploratory Factor Analysis with Intrinsic Motivation, Employee Creativity, and Organizational Innovation

Next, we conduct exploratory factor analysis for the scales of employee creativity, organizational innovation, and intrinsic motivation. The results are summarized in the table below.

**Table 3.** The results of exploratory factor analysis.

Construct	KMO	Bartlett's Test of Sphericity			Eigenvalue	Percentage of Variance Explained
		Approx. Chi-Square	Df.	Sig.		
Intrinsic Motivation (INM)	0.668	431.715	6	0.000	2.656	66.408%
Employee Creativity (EC)	0.892	1460.493	15	0.000	4.979	82.987%
Organizational Innovation (OI)	0.812	355.141	6	0.000	2.746	68.645%

Table 3 shows that the exploratory factor analysis results for the intrinsic motivation scale extracted one factor with an Eigenvalue of 2.656 (greater than 1). This factor explains 66.408% of the variance of the observed variables. For the employee creativity scale, the exploratory factor analysis extracted one factor with an Eigenvalue of 4.979 (greater than 1). This factor explains 82.987% of the variance of the observed variables. For the organizational innovation scale, the exploratory factor analysis extracted one factor with an Eigenvalue of 2.746 (greater than 1). This factor explains 68.645% of the variance of the observed variables.

#### 4.4. The Results of Assessing the Impact of Transformational Leadership Style, Employee Creativity on Organizational Innovation in Universities in Ho Chi Minh City

To test the research hypotheses to determine the factors affecting the organizational innovation of universities, the authors performed the Bayesian regression analysis.

First, we performed the OLS regression to find information about the prior distribution of the regression coefficients. We estimated a model for assessing the impact of components of the transformational leadership style scale on organizational innovation. After that, we added the employee creativity factor to the model. At the same time, the model to evaluate the impact of the components of the transformational leadership style scale on employee creativity was also estimated by OLS regression. The model to evaluate the moderating effect of intrinsic motivation on the relationship between transformational leadership style and employee creativity was estimated for the interaction variable between the components of transformational leadership style and intrinsic motivation. The estimated results are presented in the Appendix in Table 1 and Table 2. After obtaining information about the prior distribution of the regression coefficients, the results of the Bayesian regression analysis on the impact of transformational leadership style on organizational innovation are presented in the Table 4.

Table 4 shows that the posterior means of the regression coefficients are all positive, and 95% of the credible intervals of these coefficients all have lower bound values greater than 0. Therefore, variables II, IM, IS, IC all have a positive impact on OI. Thus, the components of transformational leadership style, including idealized influence (II), inspirational motivation (IM), intellectual stimulation (IS), and individual consideration (IC), have a positive impact on organizational innovation (OI). This result is consistent with related studies by Gumusluoglu & İlsev, (2009), Keller (1992), and Uddin et al. (2016) and supports hypotheses H1, H1a, H1b, H1c, H1d.

**Table 4.** The result of assessing the impact of transformational leadership style on organizational innovation.

OI	Mean	Std. Dev.	MCSE	Median	Equal-tailed [95% Cre. Interval]	
II	0.278	0.059	0.002	0.277	0.166	0.391
IM	0.358	0.060	0.002	0.359	0.241	0.472
IS	0.250	0.056	0.002	0.249	0.139	0.360
IC	0.288	0.060	0.002	0.288	0.170	0.406
_CONS	-0.477	0.260	0.011	-0.480	-0.985	0.038

**Note:** The prior distributions of regression coefficients corresponding to II, IM, IS, IC, \_cons respectively are  $normal(0.279, 0.062' 0.062)$ ,  $normal(0.359, 0.063' 0.063)$ ,  $normal(0.249, 0.059' 0.059)$ ,  $normal(0.291, 0.062' 0.062)$ ,  $normal(-0.502, 0.284' 0.284)$ . The MCMC size for analysis is 25000.

Next, we assess the impact of transformational leadership styles on employee creativity. The results are presented in the table below.

**Table 5.** The result of assessing the impact of transformational leadership style on employee creativity.

EC	Mean	Std. Dev.	MCSE	Median	Equal-tailed [95% Cre. Interval]	
II	0.323	0.039	0.001	0.324	0.247	0.400
IM	0.422	0.040	0.001	0.422	0.345	0.501
IS	0.366	0.038	0.001	0.366	0.290	0.440
IC	0.368	0.040	0.001	0.368	0.287	0.444
_CONS	-1.781	0.171	0.005	-1.779	-2.127	-1.445

**Note:** The prior distributions of regression coefficients corresponding to II, IM, IS, IC, \_cons respectively are  $normal(0.323, 0.041' 0.041)$ ,  $normal(0.421, 0.041' 0.041)$ ,  $normal(0.365, 0.039' 0.039)$ ,  $normal(0.368, 0.041' 0.041)$ ,  $normal(-1.781, 0.187' 0.187)$ . MCMC size for analysis is 25000.

Table 5 shows that the posterior means of the regression coefficients are all positive. The 95% credible intervals of these coefficients all have lower bound values greater than 0. Therefore, variables II, IM, IS, IC all have a positive impact on EC. Thus, the components of transformational leadership style, including idealized influence (II), inspirational motivation (IM), intellectual stimulation (IS), and individual consideration (IC), have a positive impact on employee creativity (EC). This result is consistent with a related study by Ng (2017) and supports hypotheses H2, H2a, H2b, H2c, H2d.

Next, we assess the impact of transformational leadership styles and employee creativity on organizational innovation. The results are presented in the table below.

**Table 6.** The result of assessing the impact of transformational leadership style and employee creativity on organizational innovation.

EC	Mean	Std. Dev.	MCSE	Median	Equal-tailed [95% Cre. Interval]	
II	0.159	0.064	0.002	0.159	0.027	0.279
IM	0.201	0.069	0.003	0.200	0.068	0.341
IS	0.111	0.067	0.003	0.112	-0.016	0.245
IC	0.158	0.068	0.004	0.157	0.025	0.290
EC	0.373	0.092	0.003	0.375	0.189	0.550
_CONS	0.161	0.291	0.010	0.169	-0.416	0.729

**Note:** The prior distributions of regression coefficients corresponding to II, IM, IS, IC, EC, \_cons respectively are  $normal(0.159, 0.069' 0.069)$ ,  $normal(0.202, 0.075' 0.075)$ ,  $normal(0.113, 0.068' 0.068)$ ,  $normal(0.154, 0.071' 0.071)$ ,  $normal(0.372, 0.102' 0.102)$ ,  $normal(0.161, 0.331' 0.331)$ . MCMC size for analysis is 25000.

Table 6 shows that the posterior means of the regression coefficients are all positive. The 95% credible intervals of these coefficients all have lower bound values greater than 0. Therefore, variables II, IM, IS, IC, EC all have a positive impact on OI. Thus, the components of transformational leadership style, including idealized influence (II), inspirational motivation (IM), intellectual stimulation (IS), individual consideration (IC), and employee creativity (EC), have a positive impact on organizational innovation (OI). Also, the regression coefficients corresponding to the components of the transformational leadership style in Tables 4 and 6 are significantly different. Specifically, Table 6 shows that when adding the employee creativity factor to the model, which evaluates the impact of transformational leadership style on organizational innovation, the regression coefficients corresponding to the components of the transformational leadership style will have smaller values. This result implies that employee creativity is a mediating factor in the impact of transformational leadership on organizational innovation. This result is consistent with related studies by Kremer et al. (2019) and Lukes & Stephan (2017) and supports hypothesis H3.

For the rest of the study, we look for evidence of the moderating effect of intrinsic motivation on the relationship between transformational leadership style and employee creativity. Specifically, we add interactive variables between intrinsic motivation and transformational leadership style components to the model, which evaluates the impact of transformational leadership style on employee creativity. The study results are presented in Table 7 below.

Table 7 shows that the regression coefficients of the interaction variables between intrinsic motivation and the components of transformational leadership style have positive values. The 95% credible intervals of these coefficients all have lower bound values greater than 0. This result shows that increasing intrinsic motivation can positively impact transformational leadership style on employee creativity. Thus, hypothesis H4 is supported.

## 5. CONCLUSION AND POLICY IMPLICATIONS

The results show that the components of transformational leadership style, including idealized influence, inspirational motivation, intellectual stimulation, and individual consideration, have positive impacts on organizational innovation and employee creativity. This result also implies that employee creativity is a mediating factor in the impact of transformational leadership style on organizational innovation. Finally, this result shows that increasing intrinsic motivation can increase the positive impact of transformational leadership style on employee creativity.

In this study, the findings show that a transformational leadership style is a good way to promote employee creativity in universities in Ho Chi Minh City. Also, in order to promote organizational innovation, universities in Ho Chi Minh City need to improve employee creativity and employee satisfaction using transformational leadership styles. Accordingly, leaders must always lead organizational change. Specifically, managers in universities must build their own image through professionalism and exemplary work, as well as demonstrating professional competence in activities. In a university, the majority of employees are people with high self-esteem, always wanting their efforts to be evaluated fairly and objectively. Therefore, departmental leaders need to consider work as a task rather than a position, and should not use administrative orders or positional power to impose on employees.

Table 7. The results of evaluating the moderating effects of intrinsic motivation via Bayes regression analysis.

Variable	(1)			(2)			(3)			(4)		
	Mean	Equal-tailed [95% Cre. Interval]		Mean	Equal-tailed [95% Cre. Interval]		Mean	Equal-tailed [95% Cre. Interval]		Mean	Equal-tailed [95% Cre. Interval]	
(Constant)	-1.416	-1.804	-1.028	-1.471	-1.885	-1.093	-1.438	-1.838	-1.042	-1.465	-1.845	-1.078
II	0.207	0.102	0.306	0.302	0.226	0.379	0.301	0.223	0.378	0.304	0.228	0.383
IM	0.403	0.323	0.483	0.315	0.206	0.426	0.403	0.326	0.479	0.408	0.331	0.487
IS	0.330	0.255	0.405	0.339	0.265	0.414	0.245	0.140	0.341	0.338	0.262	0.413
IC	0.324	0.243	0.405	0.333	0.251	0.409	0.331	0.248	0.416	0.239	0.131	0.350
IINM	0.038	0.015	0.060									
IMINM				0.034	0.008	0.058						
ISINM							0.034	0.012	0.058			
ICINM										0.032	0.009	0.055

Note: In model (1), the prior distributions of regression coefficients corresponding to II, IM, IS, IC, IINM, \_cons respectively are  $normal(0.206, 0.055' 0.055)$ ,  $normal(0.403, 0.041' 0.041)$ ,  $normal(0.331, 0.039' 0.039)$ ,  $normal(0.325, 0.042' 0.042)$ ,  $normal(0.038, 0.012' 0.012)$ ,  $normal(-1.419, 0.216' 0.216)$ . In model (2), the prior distributions of regression coefficients corresponding to II, IM, IS, IC, IMINM, \_cons respectively are  $normal(0.304, 0.041' 0.041)$ ,  $normal(0.315, 0.057' 0.057)$ ,  $normal(0.336, 0.039' 0.039)$ ,  $normal(0.334, 0.042' 0.042)$ ,  $normal(0.034, 0.013' 0.013)$ ,  $normal(-1.470, 0.217' 0.217)$ . In model (3), the prior distributions of regression coefficients corresponding to II, IM, IS, IC, ISINM, \_cons respectively are  $normal(0.302, 0.041' 0.041)$ ,  $normal(0.402, 0.041' 0.041)$ ,  $normal(0.247, 0.056' 0.056)$ ,  $normal(0.328, 0.043' 0.043)$ ,  $normal(0.034, 0.012' 0.012)$ ,  $normal(-1.436, 0.220' 0.220)$ . In model (4), the prior distributions of regression coefficients corresponding to II, IM, IS, IC, ICINM, \_cons respectively are  $normal(0.305, 0.041' 0.041)$ ,  $normal(0.409, 0.041' 0.041)$ ,  $normal(0.337, 0.039' 0.039)$ ,  $normal(0.241, 0.060' 0.060)$ ,  $normal(0.033, 0.012' 0.012)$ ,  $normal(-1.467, 0.215' 0.215)$ . MCMC size for analysis is 25000.

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## APPENDIX

**Table 1.** The results of evaluating the relationship between transformational leadership style, employee creativity and organizational innovation by OLS regression.

Variable	OI			EC			OI		
	Coefficients (robust)	SE	VIF	Coefficients	SE	VIF	Coefficients (robust)	SE	VIF
(Constant)	-0.502*	0.284		-1.781***	0.187		0.161	0.331	
II	0.279***	0.062	1.127	0.323***	0.041	1.127	0.159**	0.069	1.464
IM	0.359***	0.063	1.132	0.421***	0.041	1.132	0.202***	0.075	1.692
IS	0.249***	0.059	1.136	0.365***	0.039	1.136	0.113*	0.068	1.621
IC	0.291***	0.062	1.203	0.368***	0.041	1.203	0.154**	0.071	1.664
EC							0.372***	0.102	4.216
Durbin–Watson	2.201			1.994			2.219		
P-value (Breusch–Pagan Test)	0.097			0.743			0.056		

Table 2. The results of evaluating the moderating effects of intrinsic motivation by OLS regression.

Variable	EC			EC			EC			EC		
	Coefficients	SE	VIF	Coefficients	SE	VIF	Coefficients	SE	VIF	Coefficients	SE	VIF
(Constant)	-1.419***	0.216		-1.470***	0.217		-1.436***	0.220		-1.467***	0.215	
II	0.206***	0.055	2.107	0.304***	0.041	1.162	0.302***	0.041	1.168	0.305***	0.041	1.156
IM	0.403***	0.041	1.156	0.315***	0.057	2.179	0.402***	0.041	1.162	0.409***	0.041	1.145
IS	0.331***	0.039	1.225	0.336***	0.039	1.227	0.247***	0.056	2.487	0.337***	0.039	1.213
IC	0.325***	0.042	1.341	0.334***	0.042	1.318	0.328***	0.043	1.348	0.241***	0.060	2.691
IINM	0.038***	0.012	2.747									
IMINM				0.034***	0.013	2.821						
ISINM							0.034***	0.012	3.110			
ICINM										0.033***	0.012	3.042
Durbin–Watson	1.908			1.927			1.922			1.911		
P-value (Breusch–Pagan Test)	0.592			0.429			0.477			0.475		

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